

**ABSTRACT**

Three configurations of double barrier resonant tunneling diodes (RTD) are provided along with methods of their fabrication. The tunneling barrier layers of the diode are formed of low band offset dielectric materials and produce a diode with good I-V characteristics including negative differential resistance (NDR) with good peak-to-valley ratios (PVR). Fabrication methods of the RTD start with silicon-on-insulator substrates (SOI), producing silicon quantum wells, and are, therefore, compatible with main stream CMOS technologies such as those applied to SOI double gate transistor fabrication . Alternatively, Ge-on-insulator or SiGe-on-insulator substrates can be used if the quantum well is to be formed of Ge or SiGe. The fabrication methods include the formation of both vertical and horizontal silicon quantum well layers. The vertically formed layer may be oriented so that its vertical sides are in any preferred crystallographic plane, such as the 100 or 110 planes.